

WHAT IS CLAIMED IS:

1. A font processing device, comprising:
  - a data acquiring device that acquires font data of a bitmap font;
  - a lengthwise analyzing device that analyzes pixel formation of the font data lengthwise;
  - a widthwise enlargement/reduction device that enlarges or reduces the font data widthwise based on a lengthwise analysis result;
  - a widthwise analyzing device that analyzes pixel formation of the font data widthwise; and
  - a lengthwise enlargement/reduction device that enlarges or reduces the font data lengthwise based on a widthwise analysis result.
2. The font processing device according to claim 1, the lengthwise analyzing device further comprising:
  - a dividing device that divides the font data into a plurality of columns; and
  - a calculating device that calculates, for each column, a cost that represents pixel formation features, and
  - the widthwise enlargement/reduction device executing pixel enlargement or reduction for a desired number of columns in the ascending order of column cost.
3. The font processing device according to claim 1, the lengthwise analyzing device further comprising:
  - a dividing device that divides the font data into a plurality of columns; and
  - a calculating device that calculates, for each column, a cost that represents pixel formation features, and
  - the widthwise enlargement/reduction device executing pixel enlargement or reduction for a desired number of columns in the descending order of column cost.
4. The font processing device according to claim 1, the widthwise analyzing device further comprising:
  - a dividing device that divides the font data into a plurality of rows; and
  - a calculating device that calculates, for each row, a cost that represents pixel formation features, and
  - the lengthwise enlargement/reduction device executing pixel enlargement or reduction for a desired number of rows in the ascending order of row cost.
5. The font processing device according to claim 1, the widthwise analyzing device further comprising:

a dividing device that divides the font data into a plurality of rows; and  
 a calculating device that calculates, for each row, a cost that represents pixel formation features, and

the lengthwise enlargement/reduction device executing pixel enlargement or reduction for a desired number of rows in the descending order of row cost.

6. A font processing device, comprising:

a data acquiring device that acquires font data of a bitmap font;

a widthwise enlargement processing device that enlarges the font data widthwise; and

a lengthwise enlargement processing device that enlarges the font data lengthwise,

the widthwise enlargement processing device further comprising:

a dividing device that divides the font data into a plurality of columns;

a cost calculating device that calculates a cost that represents a line segment volume of a pixel formation, for each column; and

an enlarging device that executes widthwise pixel enlargement for a desired number of columns in the ascending order of column cost, and

the lengthwise enlargement processing device further comprising:

a dividing device that divides the font data into a plurality of rows;

a cost calculating device that calculates a cost that represents a line segment volume of the pixel formation, for each row; and

an enlarging device that executes lengthwise pixel enlargement for a desired number of rows in the ascending order of row cost.

7. A font processing device, comprising:

a data acquiring device that acquires font data of a bitmap font;

a widthwise enlargement processing device that enlarges the font data widthwise; and

a lengthwise enlargement processing device that enlarges the font data lengthwise,

the widthwise enlargement processing device comprises:

a dividing device that divides the font data into a plurality of columns;

a cost calculating device that calculates a cost that represents a line segment volume of a pixel formation, for each column; and

an enlarging device that executes widthwise pixel enlargement for a desired number of columns in the descending order of column cost, and

the lengthwise enlargement processing device further comprising:

a dividing device that divides the font data into a plurality of rows;

a cost calculating device that calculates a cost that represents a line segment volume of the pixel formation, for each row; and

an enlarging device that executes lengthwise pixel enlargement for a desired number of rows in the descending order of row cost.

8. The font processing device according to claim 6, the desired number depends on the number of pixels lengthwise and widthwise, and on an enlargement ratios of the font data.

9. The font processing device according to claim 6, the cost calculating device further comprising:

a calculating device that calculates as the cost the number of pixels forming the column or the row for each column or each row; and

an adding device that adds the number of pixels having adjacent pixels in the column or row to the cost.

10. The font processing device according to claim 6, the cost calculating device comprising:

a calculating device that calculates the number of pixels forming the column or the row for each column or each row; and

an adding and calculating device that adds the number of pixels having adjacent pixels in the column or row to the number of pixels forming the column or the row, and calculates an inverse number of the added result as the cost.

11. The font processing device according to claim 6, the font data comprising processing order information that represents the order of lengthwise enlargement processing and widthwise enlargement processing to be executed in enlargement processing of the font data, and

the font processing device further comprising an order controlling device that controls the execution order of the lengthwise enlargement processing and the widthwise enlargement processing based on the processing order information.

12. A font processing device, comprising:

a data acquiring device that acquires font data of a bitmap font;

a widthwise reduction processing device that reduces the font data widthwise;  
and

a lengthwise reduction processing device that reduces the font data lengthwise,  
the widthwise reduction processing device further comprising:

a dividing device that divides the font data into a plurality of columns;

a cost calculating device that calculates a cost that represents a degree  
of likeness to a pixel formation in an adjacent column, for each column; and

a reducing device that executes widthwise pixel reduction for a desired  
number of columns in the ascending order of cost; and

the lengthwise reduction processing device further comprising:

a dividing device that divides the font data into a plurality of rows;

a cost calculating device that calculates a cost that represents a likeness  
to a pixel formation in an adjacent row, for each row; and

a reducing device that executes lengthwise pixel reduction for a desired  
number of rows in the ascending order of row cost.

13. A font processing device, comprising:

a data acquiring device that acquires font data of a bitmap font;

a widthwise reduction processing device that reduces the font data widthwise;  
and

a lengthwise reduction processing device that reduces the font data lengthwise,  
the widthwise reduction processing device further comprising:

a dividing device for dividing the font data into a plurality of columns;

a cost calculating device for calculating a cost that represents a degree  
of likeness to a pixel formation of an adjacent column, for each column; and

a reducing device that executes widthwise pixel reduction for a desired  
number of columns in the descending order of column cost; and

the lengthwise reduction processing device further comprising:

a dividing device that divides the font data into a plurality of rows;

a cost calculating device that calculates a cost that represents a degree  
of likeness to a pixel formation in an adjacent row, for each row; and

a reducing device that executes lengthwise pixel reduction for a desired  
number of rows in the descending order of row cost.

14. The font processing device according to claim 12, the desired number depending on the number of pixels lengthwise and widthwise of the font data, and on the reduction ratios of the font data.

15. The font processing device according to claim 12, the cost calculating device calculating the costs based on the exclusive-OR pixel formation of the column or the row for each column and each row and the pixel formation of a column or a row adjacent to said column or said row.

16. The font processing device according to claim 12, the font data comprising processing order information that represents the order of lengthwise reduction processing and widthwise reduction processing to be executed in the reduction processing of the font data, and

the font processing device further comprising an order controlling device that controls the execution order of lengthwise reduction processing and widthwise reduction processing based on the processing order information.

17. A terminal device, comprising:  
the font processing device according to claim 1;  
a memory that stores the font data generated by the font processing device; and  
a display part that displays the font data generated by the font processing device.

18. A method of processing a font, comprising:  
acquiring font data of a bitmap font;  
analyzing pixel formation of the font data lengthwise;  
enlarging/reducing the font data widthwise based on a lengthwise analysis result;  
analyzing the pixel formation of the font data widthwise; and  
enlarging or reducing the font data lengthwise based on a widthwise analysis result.

19. A method of processing a font, comprising:  
acquiring font data of a bitmap font;  
enlarging the font data widthwise; and  
enlarging the font data lengthwise,  
the step of enlarging the font data widthwise further comprising:  
dividing the font data into a plurality of columns;

calculating a cost that represents a line segment volume of a pixel formation, for each column; and

executing widthwise pixel enlargement for a desired number of columns in the ascending order of column cost; and

the step of enlarging the font data lengthwise further comprising:

dividing the font data into a plurality of rows;

calculating a cost that represents a line segment volume of the pixel formation, for each row; and

executing lengthwise pixel enlargement for a desired number of rows in the ascending order of row cost.

20. A method of processing a font, comprising:

acquiring font data of a bitmap font;

enlarging the font data widthwise; and

enlarging the font data lengthwise,

the step of enlarging the font data widthwise comprising:

dividing the font data into a plurality of columns;

calculating a cost that represents a line segment volume of a pixel formation, for each column; and

executing widthwise pixel enlargement for a desired number of columns in the descending order of column cost;

the step of enlarging the font data lengthwise comprising:

dividing the font data into a plurality of rows;

calculating a cost that represents a line segment volume of the pixel formation, for each row; and

executing lengthwise pixel enlargement for a desired number of rows in the descending order of row cost.

21. A method of processing a font, comprising:

acquiring font data of a bitmap font;

reducing the font data widthwise; and

reducing the font data lengthwise,

the step of reducing the font data widthwise comprising:

dividing the font data into a plurality of columns;

calculating a cost that represents a degree of likeness to a pixel formation in an adjacent column, for each column; and

executing widthwise pixel reduction for a desired number of columns in the ascending order of column cost;

the step of reducing the font data lengthwise comprising:

dividing the font data into a plurality of rows;

calculating a cost that represents a degree of likeness to a pixel formation in an adjacent row, for each row; and

executing lengthwise pixel reduction for a desired number of rows in the ascending order of row cost.

22. A method of processing a font, comprising:

acquiring font data of a bitmap font;

reducing the font data widthwise; and

reducing the font data lengthwise,

the step of reducing the font data widthwise comprising:

dividing the font data into a plurality of columns;

calculating a cost that represents a degree of likeness to a pixel formation in an adjacent column, for each column; and

executing widthwise pixel reduction for a desired number of columns in the descending order of column cost; and

the step of reducing the font data lengthwise comprising:

dividing the font data into a plurality of rows;

calculating a cost that represents a degree of likeness to a pixel formation in an adjacent row, for each row; and

executing lengthwise pixel reduction for a desired number of rows in the descending order of row cost.

23. A font processing program to be executed in a terminal device having a computer, the font processing program making the computer function as:

a data acquiring device that acquires font data of a bitmap font;

a lengthwise analyzing device that analyzes the pixel formation of the font data lengthwise;

a widthwise enlargement/reduction device that enlarges or reduces the font data widthwise based on the lengthwise analysis result;

a widthwise analyzing device that analyzes the pixel formation of the font data widthwise; and

a lengthwise enlargement/reduction device that enlarges or reduces the font data lengthwise based on the widthwise analysis result.

24. A font processing program to be executed in a terminal device having a computer, the font processing program making the computer function as:

a data acquiring device that acquires font data of a bitmap font;

a widthwise enlargement processing device that enlarges the font data widthwise; and

a lengthwise enlargement processing device that enlarges the font data lengthwise,

the widthwise enlargement processing device comprising:

dividing device that divides the font data into a plurality of columns;

cost calculating device that calculates a cost that represents a line segment volume of a pixel formation, for each column; and

enlarging device that executes widthwise pixel enlargement for a desired number of columns in the ascending order of column cost; and

the lengthwise enlargement processing device comprising:

dividing device that divides the font data into a plurality of rows;

cost calculating device that calculates a cost that represents a line segment volume of a pixel formation, for each row; and

enlarging device that executes lengthwise pixel enlargement for a desired number of rows in the ascending order of row cost.

25. A font processing program to be executed in a terminal device having a computer, the font processing program making the computer function as:

a data acquiring device that acquires font data of a bitmap font;

a widthwise enlargement processing device that enlarges the font data widthwise; and

a lengthwise enlargement processing device that enlarges the font data lengthwise,

the widthwise enlargement processing device further comprising:

a dividing device that divides the font data into a plurality of columns;

a cost calculating device that calculates a cost that represents a line segment volume of a pixel formation, for each column; and

a enlarging device that executes widthwise pixel enlargement for a desired number of columns in the descending order of column cost; and



the lengthwise enlargement processing device further comprising:

a dividing device that divides the font data into a plurality of rows;

a cost calculating device that calculates a cost that represents a line segment volume of a pixel formation, for each row; and

a enlarging device that executes lengthwise pixel enlargement for a desired number of rows in the descending order of row cost.

26. A font processing program to be executed in a terminal device having a computer, the font processing program making the computer function as:

a data acquiring device that acquires font data of a bitmap font;

a widthwise reduction processing device that reduces the font data widthwise;

and

a lengthwise reduction processing device that reduces the font data lengthwise, the widthwise reduction processing device comprising:

a dividing device that divides the font data into a plurality of columns;

a cost calculating device that calculates a cost that represents a degree of likeness to a pixel formation in an adjacent column, for each column; and

a reducing device that executes widthwise pixel reduction for a desired number of columns in the ascending order of column cost; and

the lengthwise reduction processing device further comprising:

a dividing device that divides the font data into a plurality of rows;

a cost calculating device that calculates a cost that represents a degree of likeness to a pixel formation in an adjacent row, for each row; and

a reducing device that executes lengthwise pixel reduction for a desired number of rows in the ascending order of row cost.

27. A font processing program to be executed in a terminal device having a computer, the font processing program making the computer function as:

a data acquiring device that acquires font data of a bitmap font;

a widthwise reduction processing device that reduces the font data widthwise;

and

a lengthwise reduction processing device that reduces the font data lengthwise, the widthwise reduction processing device further comprising:

a dividing device that divides the font data into a plurality of columns;

a cost calculating device that calculates a cost that represents a degree of likeness to a pixel formation in an adjacent column, for each column; and

a reducing device that executes widthwise pixel reduction for a desired number of columns in the descending order of column cost; and

the lengthwise reduction processing device further comprising:

a dividing device that divides the font data into a plurality of rows;

a cost calculating device that calculates a cost that represents a degree of likeness to a pixel formation in an adjacent row, for each row; and

a reducing device that executes lengthwise pixel reduction for a desired number of rows in the descending order of row cost.

28. A font processing device, comprising:

a receiving device that receives a font modification indication;

an acquiring device that acquires font data of a bitmap font;

a widthwise modifying device that, when the font modification indication includes widthwise font modification, analyzes the pixel formation of the font data lengthwise and enlarging or reducing the font data widthwise based on the lengthwise analysis result; and

a lengthwise modifying device that, when the font modification indication includes lengthwise font modification, analyzes the pixel formation of the font data widthwise and enlarging or reducing the font data lengthwise based on the widthwise analysis result.

29. The font processing device according to claim 28, the widthwise modifying device further comprising:

a dividing device that divides the font data into a plurality of columns;

a calculating device that calculates a cost that represents pixel formation features, for each column; and

an executing device that executes pixel enlargement or reduction processing for a desired number of columns in the ascending order of column cost.

30. The font processing device according to claim 28, the widthwise modifying device further comprising:

a dividing device that divides the font data into a plurality of columns;

a calculating device that calculates a cost that represents pixel formation features, for each column; and

an executing device that executes pixel enlargement or reduction processing for a desired number of columns in the descending order of column cost.

31. The font processing device according to claim 28, the lengthwise modifying device further comprising:

a dividing device that divides the font data into a plurality of rows;

a calculating device that calculates a cost that represents pixel formation features, for each row; and

an executing device that executes pixel enlargement or reduction processing for a desired number of rows in the ascending order of row cost.

32. The font processing device according to claim 28, the lengthwise modifying device further comprising:

a dividing device that divides the font data into a plurality of rows;

a calculating device that calculates a cost that represents pixel formation features, for each row; and

an executing device that executes pixel enlargement or reduction processing for a desired number of rows in the descending order of row cost.

33. A font processing device, comprising:

a receiving device that receives a font modification indication including lengthwise and widthwise modification ratios;

a data acquiring device that acquires font data of a bitmap font;

a widthwise modifying device that processes widthwise modification of the font data in accordance with the widthwise modification ratio; and

a lengthwise modifying device that processes lengthwise modification of the font data in accordance with the lengthwise modification ratio,

the widthwise modifying device further comprising:

a dividing device that divides the font data into a plurality of columns;

a first cost calculating device that calculates a cost that represents pixel formation features, for each of the plurality of columns; and

a widthwise enlarging or reducing device that enlarges or reduces a first desired number of columns widthwise in the ascending order of column cost; and

the lengthwise modifying device further comprising:

a dividing device that divides the font data into a plurality of rows;

a second cost calculating device that calculates a cost that represents pixel formation features, for each of the plurality of rows; and

a lengthwise enlarging or reducing device that enlarges or reduces a second desired number of rows lengthwise in the ascending order of row cost.

34. A font processing device, comprising:
- a receiving device that receives a font modification indication including lengthwise and widthwise modification ratios;
  - a data acquiring device that acquires font data of a bitmap font;
  - a widthwise modifying device that processes widthwise modification of the font data in accordance with the widthwise modification ratio; and
  - a lengthwise modifying device that processes lengthwise modification of the font data in accordance with the lengthwise modification ratio,
- the widthwise modifying device further comprising:
- a dividing device that divides the font data into a plurality of columns;
  - a first cost calculating device that calculates a cost that represents pixel formation features, for each of the plurality of columns; and
  - a widthwise enlarging or reducing device that enlarges or reduces a first desired number of columns widthwise in the descending order of column cost; and
- the lengthwise modifying device further comprising:
- a dividing device that divides the font data into a plurality of rows;
  - a second cost calculating device that calculates a cost that represents pixel formation features, for each of the plurality of rows; and
  - a lengthwise enlarging or reducing device that enlarges or reduces a second desired number of rows lengthwise in the descending order of row cost.
35. The font processing device according to claim 33, the first desired number depending on the number of lengthwise and widthwise pixels of the font data and on the widthwise modification ratio, and the second desired number depending on the number of lengthwise and widthwise pixels of the font data and on the lengthwise modification ratio.
36. The font processing device according to claim 33, the cost calculating device calculating a cost that represents a line segment volume of the pixel formation for each of the plurality of columns or rows when the modification processing is an enlargement processing, and calculating a cost that represents a degree of likeness between the pixel formation in the current column or row and the pixel formation in an adjacent column or row, for each of the plurality of columns or rows, when the modification processing is a reduction processing.
37. The font processing device according to claim 36, the cost calculating device, when calculating a cost representing the line segment volume, calculating as the cost the number of pixels forming the column or the row for each column or each row, and further adding the number of pixels in the column or row having adjacent pixels to the cost.

38. The font processing device according to claim 36, the cost calculating device, when calculating a cost representing the line segment volume, calculating the number of pixels forming the column or the row for each column or each row, and further adding the number of pixels having adjacent pixels in the column or the row to the number of pixels forming the column or the row, and calculates an inverse number of the added result as a cost.

39. The font processing device according to claim 36, the cost calculating device, when calculating a cost representing the degree of likeness, calculating the cost based on the exclusive-OR of the pixel formation of the column or the row for each column and each row and the pixel formation of a column or a row adjacent to said column or said row.

40. The font processing device according to claim 33, the font data comprising processing order information that represents the order of the lengthwise modification processing and the widthwise modification processing to be executed in the modification processing of the font data, and the font processing device further comprising a order controlling device that controls the execution order of the lengthwise modification processing and the widthwise modification processing based on the processing order information.

41. A terminal device, comprising:  
the font processing device according to claim 28;  
a memory that stores the font data generated by the font processing device; and  
a display part that displays the font data generated by the font processing device.

42. A method of processing a font, comprising:  
receiving a font modification indication;  
acquiring font data of a bitmap font;  
widthwise modifying, when the font modification indication includes widthwise font modification, of analyzing the pixel formation of the font data lengthwise and enlarging or reducing the font data widthwise based on the lengthwise analysis result; and  
lengthwise modifying, when the font modification indication includes widthwise font modification, of analyzing the pixel formation of the font data widthwise and enlarging or reducing the font data lengthwise based on the widthwise analysis result.

43. A method of processing a font, comprising:  
receiving a font modification indication including lengthwise and widthwise modification ratios;  
acquiring font data of a bitmap font;  
processing widthwise modification of the font data in accordance with the widthwise modification ratio; and

processing lengthwise modification of the font data in accordance with the lengthwise modification ratio,

the step of processing widthwise modification of the font data further comprising:

dividing the font data into a plurality of columns;

calculating a first cost that represents pixel formation features, for each of the plurality of columns; and

firstly enlarging or reducing a first desired number of columns widthwise in the ascending order of column cost; and

the step of processing lengthwise modification of the font data further comprising:

dividing the font data into a plurality of rows;

calculating a second cost that represents pixel formation features, for each of the plurality of rows; and

secondly enlarging or reducing a second desired number of rows lengthwise in the ascending order of row cost.

44. A method of processing a font, comprising:

receiving a font modification indication including lengthwise and widthwise modification ratio;

acquiring font data of a bitmap font;

processing widthwise modification of the font data in accordance with the widthwise modification ratio; and

processing lengthwise modification of the font data in accordance with the lengthwise modification ratio,

the step of processing widthwise modification of the font data comprising:

dividing the font data into a plurality of columns;

calculating a first cost that represents pixel formation features, for each of the plurality of columns; and

firstly enlarging or reducing a first desired number of columns widthwise in the descending order of column cost; and

the step of processing lengthwise modification of the font data comprising:

dividing the font data into a plurality of rows;

calculating a second cost that represents pixel formation features, for each of the plurality of rows; and

secondly enlarging or reducing a second desired number of rows lengthwise in the descending order of row cost.

45. A font processing program to be executed in a terminal device having a computer, wherein the font processing program making the computer function as:

- a receiving device that receives a font modification indication;
- an acquiring device that acquires font data of a bitmap font;
- a widthwise modifying device that, when the font modification indication include widthwise font modification, analyzes the pixel formation of the font data lengthwise and enlarging or reducing the font data widthwise based on a lengthwise analysis result;
- a lengthwise modifying device that, when the font modification indication include widthwise font modification, analyzes the pixel formation of the font data widthwise and enlarging or reducing the font data lengthwise based on a widthwise analysis result.

46. A font processing program to be executed in a terminal device having a computer, wherein the font processing program making the computer function as:

- a receiving device that receives a font modification indication including lengthwise and widthwise modification ratios;
  - a data acquiring device that acquires font data of a bitmap font;
  - a widthwise modifying device that processes widthwise modification of the font data in accordance with the widthwise modification ratio; and
  - a lengthwise modifying device that processes lengthwise modification of the font data in accordance with the lengthwise modification ratio,
- the widthwise modifying device further comprising:
- a dividing device that divides the font data into a plurality of columns;
  - a first cost calculating device that calculates a cost that represents pixel formation features, for each of the plurality of columns; and
  - a widthwise enlarging or reducing device that enlarges or reduces a first desired number of columns widthwise in the ascending order of column cost; and
- the lengthwise modifying device further comprising:
- a dividing device that divides the font data into a plurality of rows;
  - a second cost calculating device that calculates a cost that represents pixel formation features, for each of the plurality of rows; and
  - a lengthwise enlarging or reducing device that enlarges or reduces a second desired number of rows lengthwise in the ascending order of row cost.

47. A font processing program to be executed in a terminal device having a computer, wherein the font processing program making the computer function as:

- a receiving device that receives a font modification indication including lengthwise and widthwise modification ratios;

- a data acquiring device that acquires font data of a bitmap font;

- a widthwise modifying device that processes widthwise modification of the font data in accordance with the widthwise modification ratio; and

- a lengthwise modifying device that processes lengthwise modification of the font data in accordance with the lengthwise modification ratio,

- the widthwise modifying device further comprising:

- a dividing device that divides the font data into a plurality of columns;

- a first cost calculating device that calculates a cost that represents pixel formation features, for each of the plurality of columns; and

- a widthwise enlarging or reducing device that enlarges or reduces a first desired number of columns widthwise in the descending order of column cost; and

- the lengthwise modifying device further comprising:

- a dividing device that divides the font data into a plurality of rows;

- a second cost calculating device that calculates a cost that represents pixel formation features, for each of the plurality of rows; and

- a lengthwise enlarging or reducing device that enlarges or reduces a second desired number of rows lengthwise in the descending order of row cost.